



## Supplementary Material

# Comparative Transcriptome Analysis Depicts Candidate Genes Involved in Skin Color Differentiation in Red Tilapia

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### Supplementary Table I. KEGG pathway classification of contigs.

| Pathway (Up_regulated)   | Number of contigs (n) | Pathway (Down_regulated)  | Number of contigs (n) |
|--|-----------------------|---|-----------------------|
| Carbon metabolism  | 10                    | Carbon metabolism   | 1                     |
| 2 Oxocarboxylic acid metabolism  | 1                     | 2-Oxocarboxylic acid metabolism   | 1                     |
| Fatty acid metabolism  | 3                     | Fatty acid metabolism   | 2                     |
| Biosynthesis of amino acids  | 9                     | Biosynthesis of amino acids   | 1                     |
| Degradation of aromatic compounds; Glycolysis<br>Gluconeogenesis               | 9                     | Degradation of aromatic compounds; Glycolysis<br>Gluconeogenesis; Citrate cycle TCA cycle; Pentose<br>phosphate pathway   | 1                     |
| Citrate cycle TCA cycle  | 2                     | Pentose and glucuronate interconversions  | 2                     |
| Pentose phosphate pathway  | 5                     | Fructose and mannose metabolism   | 3                     |
| Pentose and glucuronate interconversions; Fruc-<br>tose and mannose metabolism | 4                     | Galactose metabolism; Ascorbate and aldarate<br>metabolism; Starch and sucrose metabolism   | 1                     |
| Galactose metabolism   | 1                     | Amino sugar and nucleotide sugar metabolism   | 1                     |
| Ascorbate and aldarate metabolism; Starch and<br>sucrose metabolism            | 2                     | Pyruvate metabolism; Glyoxylate and dicarboxylate<br>metabolism; Propanoate metabolism; Butanoate<br>metabolism; C5 Branched dibasic acid metabolism;<br>Inositol phosphate metabolism  | 1                     |
| Amino sugar and nucleotide sugar metabolism                                    | 3                     | Oxidative phosphorylation   | 1                     |
| Pyruvate metabolism  | 4                     | Photosynthesis; Photosynthesis antenna proteins;<br>Photosynthesis proteins; Carbon fixation in photo-<br>synthetic organisms; Carbon fixation pathways in<br>prokaryotes; Methane metabolism; Nitrogen metab-<br>olism; Sulfur metabolism; Fatty acid biosynthesis | 1                     |
| Glyoxylate and dicarboxylate metabolism  | 3                     | Fatty acid elongation   | 2                     |

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| Pathway (Up_regulated)  | Number of contigs (n) | Pathway (Down_regulated)  | Number of contigs (n) |
|---|-----------------------|---|-----------------------|
| Propanoate metabolism   | 1                     | Fatty acid degradation; Synthesis and degradation of ketone bodies; Cutin suberine and wax biosynthesis; Steroid biosynthesis | 5                     |
| Butanoate metabolism; C5 Branched dibasic acid metabolism; Inositol phosphate metabolism  | 1                     | Primary bile acid biosynthesis  | 1                     |
| Oxidative phosphorylation   | 7                     | Secondary bile acid biosynthesis; Steroid hormone biosynthesis  | 1                     |
| Photosynthesis; Photosynthesis antenna proteins; Photosynthesis proteins; Carbon fixation in photosynthetic organisms                 | 5                     | Glycerolipid metabolism   | 2                     |
| Carbon fixation pathways in prokaryotes   | 1                     | Glycerophospholipid metabolism  | 3                     |
| Methane metabolism  | 5                     | Ether lipid metabolism  | 1                     |
| Nitrogen metabolism   | 3                     | Sphingolipid metabolism; Arachidonic acid metabolism  | 5                     |
| Sulfur metabolism   | 1                     | Linoleic acid metabolism  | 1                     |
| Fatty acid biosynthesis; Fatty acid elongation  | 8                     | alpha Linolenic acid metabolism   | 1                     |
| Fatty acid degradation  | 1                     | Biosynthesis of unsaturated fatty acids   | 2                     |
| Synthesis and degradation of ketone bodies; Cutin suberine and wax biosynthesis; Steroid biosynthesis; Primary bile acid biosynthesis | 1                     | Lipid biosynthesis proteins; Purine metabolism  | 3                     |
| Secondary bile acid biosynthesis; Steroid hormone biosynthesis  | 9                     | Pyrimidine metabolism   | 3                     |
| Glycerolipid metabolism   | 1                     | Alanine aspartate and glutamate metabolism  | 3                     |
| Glycerophospholipid metabolism  | 1                     | Glycine serine and threonine metabolism; Cysteine and methionine metabolism   | 3                     |
| Ether lipid metabolism  | 1                     | Valine leucine and isoleucine degradation   | 3                     |
| Sphingolipid metabolism   | 2                     | Valine leucine and isoleucine biosynthesis; Lysine biosynthesis   | 1                     |
| Arachidonic acid metabolism   | 4                     | Lysine degradation  | 5                     |
| Linoleic acid metabolism; alpha Linolenic acid metabolism; Biosynthesis of unsaturated fatty acids                                    | 7                     | Arginine biosynthesis; Arginine and proline metabolism  | 1                     |
| Lipid biosynthesis proteins; Purine metabolism  | 10                    | Histidine metabolism; Tyrosine metabolism   | 3                     |
| Pyrimidine metabolism   | 9                     | Phenylalanine metabolism  | 3                     |
| Alanine aspartate and glutamate metabolism  | 3                     | Tryptophan metabolism   | 4                     |
| Glycine serine and threonine metabolism   | 1                     | Phenylalanine tyrosine and tryptophan biosynthesis  | 3                     |
| Cysteine and methionine metabolism  | 3                     | Amino acid related enzymes; beta Alanine metabolism; Taurine and hypotaurine metabolism                                       | 3                     |
| Valine leucine and isoleucine degradation; Valine leucine and isoleucine biosynthesis; Lysine biosynthesis; Lysine degradation        | 2                     | Phosphonate and phosphinate metabolism; Seleno-compound metabolism; Cyanoamino acid metabolism                                | 3                     |
| Arginine biosynthesis   | 2                     | D Glutamine and D glutamate metabolism; D Arginine and D ornithine metabolism; D Alanine metabolism; Glutathione metabolism   | 3                     |
| Arginine and proline metabolism   | 4                     | Glycosyltransferases; N Glycan biosynthesis; Various types of N glycan biosynthesis   | 1                     |

*Table continue on next page .....*

| Pathway (Up_regulated)   | Number of contigs (n) | Pathway (Down_regulated)   | Number of contigs (n) |
|--|-----------------------|--|-----------------------|
| Histidine metabolism; Tyrosine metabolism; Phenylalanine metabolism; Tryptophan metabolism   | 3                     | Mucin type O glycan biosynthesis   | 1                     |
| Phenylalanine tyrosine and tryptophan biosynthesis; Amino acid related enzymes; beta Alanine metabolism  | 1                     | Other types of O glycan biosynthesis   | 2                     |
| Taurine and hypotaurine metabolism   | 1                     | Glycosaminoglycan biosynthesis chondroitin sulfate dermatan sulfate; Glycosaminoglycan biosynthesis heparan sulfate heparin; Glycosaminoglycan biosynthesis keratan sulfate; Proteoglycans; Glycosaminoglycan binding proteins; Glycosylphosphatidylinositol GPI anchored proteins; Glycosaminoglycan degradation                      | 1                     |
| Phosphonate and phosphinate metabolism; Selenocompound metabolism; Cyanoamino acid metabolism; D Glutamine and D glutamate metabolism; D Arginine and D ornithine metabolism; D Alanine metabolism; Glutathione metabolism                           | 4                     | Glycosylphosphatidylinositol GPI anchor biosynthesis; Glycosphingolipid biosynthesis lacto and neolacto series   | 1                     |
| Glycosyltransferases; N Glycan biosynthesis; Various types of N glycan biosynthesis; Mucin type O glycan biosynthesis  | 2                     | Glycosphingolipid biosynthesis globo series; Glycosphingolipid biosynthesis ganglio series; Lipopolysaccharide biosynthesis; Lipopolysaccharide biosynthesis proteins; Peptidoglycan biosynthesis; Other glycan degradation; Thiamine metabolism; Riboflavin metabolism; Vitamin B6 metabolism; Nicotinate and nicotinamide metabolism | 8                     |
| Other types of O glycan biosynthesis; Glycosaminoglycan biosynthesis chondroitin sulfate dermatan sulfate; Glycosaminoglycan biosynthesis heparan sulfate heparin  | 1                     | Pantothenate and CoA biosynthesis; Biotin metabolism   | 1                     |
| Glycosaminoglycan biosynthesis keratan sulfate   | 1                     | Lipoic acid metabolism; Folate biosynthesis; One carbon pool by folate; Retinol metabolism   | 3                     |
| Proteoglycans; Glycosaminoglycan binding proteins; Glycosylphosphatidylinositol GPI anchored proteins; Glycosaminoglycan degradation; Glycosylphosphatidylinositol GPI anchor biosynthesis; Glycosphingolipid biosynthesis lacto and neolacto series | 1                     | Porphyry and chlorophyll metabolism; Ubiquinone 1 and other terpenoid quinone biosynthesis; Prenyltransferases; Terpenoid backbone biosynthesis  | 1                     |
| Glycosphingolipid biosynthesis globo series  | 1                     | Monoterpenoid biosynthesis; Sesquiterpenoid and triterpenoid biosynthesis  | 1                     |

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|---|---|---|---|
| Glycosphingolipid biosynthesis ganglio series   | 1 | Diterpenoid biosynthesis; Carotenoid biosynthesis; Brassinosteroid biosynthesis; Insect hormone biosynthesis; Zeatin biosynthesis; Limonene and pinene degradation; Geraniol degradation; Polyketide biosynthesis proteins; Type I polyketide structures; Biosynthesis of 12 14 and 16 membered macrolides; Biosynthesis of ansamycins; Biosynthesis of type II polyketide backbone; Biosynthesis of type II polyketide products; Tetracycline biosynthesis; Polyketide sugar unit biosynthesis; Nonribosomal peptide structures; Biosynthesis of siderophore group nonribosomal peptides; Biosynthesis of vancomycin group antibiotics; Phenylpropanoid biosynthesis; Stilbenoid diarylheptanoid and gingerol biosynthesis; Flavonoid biosynthesis; Flavone and flavonol biosynthesis; Anthocyanin biosynthesis; Isoflavonoid biosynthesis; Indole alkaloid biosynthesis; Indole diterpene alkaloid biosynthesis; Isoquinoline alkaloid biosynthesis   | 3 |
| Lipopolysaccharide biosynthesis; Lipopolysaccharide biosynthesis proteins; Peptidoglycan biosynthesis; Other glycan degradation; Thiamine metabolism; Riboflavin metabolism | 2 | Tropane piperidine and pyridine alkaloid biosynthesis; Acridone alkaloid biosynthesis; Caffeine metabolism; Betalain biosynthesis; Glucosinolate biosynthesis; Benzoxazinoid biosynthesis; Penicillin and cephalosporin biosynthesis; Carbapenem biosynthesis; Monobactam biosynthesis; Clavulanic acid biosynthesis; Streptomycin biosynthesis; Butirosin and neomycin biosynthesis; Puromycin biosynthesis; Novobiocin biosynthesis; Aflatoxin biosynthesis; Benzoate degradation; Aminobenzoate degradation; Fluorobenzoate degradation; Chloroalkane and chloroalkene degradation; Chlorocyclohexane and chlorobenzene degradation; Toluene degradation; Xylene degradation; Nitrotoluene degradation; Ethylbenzene degradation; Styrene degradation; Atrazine degradation; Caprolactam degradation; 1 1 1 Trichloro 2 2 bis 4 chlorophenyl ethane DDT degradation; Bisphenol degradation; Dioxin degradation; Naphthalene degradation; Polycyclic aromatic hydrocarbon degradation; Furfural degradation; Steroid degradation; Metabolism of xenobiotics by cytochrome P450; Drug metabolism cytochrome P450 | 1 |
| Vitamin B6 metabolism; Nicotinate and nicotinamide metabolism   | 5 | Drug metabolism other enzymes; Enzymes; Protein kinases; Protein phosphatase and associated proteins; Peptidases; Cytochrome P450; KEGG modules in global; RNA polymerase; Basal transcription factors  | 1 |
| Pantothenate and CoA biosynthesis; Biotin metabolism; Lipoic acid metabolism; Folate biosynthesis; One carbon pool by folate  | 1 | Transcription factors; Transcription machinery; Spliceosome   | 2 |
| Retinol metabolism  | 8 | Spliceosome; Ribosome   | 1 |
| Porphyrin and chlorophyll metabolism; Ubiquinone and other terpenoid quinone biosynthesis; Prenyltransferases; Terpenoid backbone biosynthesis                              | 1 | Ribosome; Transfer RNA biogenesis; Aminoacyl tRNA biosynthesis; RNA transport; mRNA surveillance pathway  | 1 |

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|--|---|---|---|
| Monoterpenoid biosynthesis; Sesquiterpenoid and triterpenoid biosynthesis; Diterpenoid biosynthesis; Carotenoid biosynthesis; Brassinosteroid biosynthesis; Insect hormone biosynthesis; Zeatin biosynthesis; Limonene and pinene degradation; Geraniol degradation; Polyketide biosynthesis proteins; Type I polyketide structures; Biosynthesis of 12 14 and 16 membered macrolides; Biosynthesis of ansamycins; Biosynthesis of type II polyketide backbone; Biosynthesis of type II polyketide products; Tetracycline biosynthesis; Polyketide sugar unit biosynthesis; Nonribosomal peptide structures; Biosynthesis of siderophore group non-ribosomal peptides; Biosynthesis of vancomycin group antibiotics; Phenylpropanoid biosynthesis; Stilbenoid diarylheptanoid and gingerol biosynthesis; Flavonoid biosynthesis; Flavone and flavonol biosynthesis; Anthocyanin biosynthesis; Isoflavonoid biosynthesis; Indole alkaloid biosynthesis; Indole diterpene alkaloid biosynthesis; Isoquinoline alkaloid biosynthesis; Tropane piperidine and pyridine alkaloid biosynthesis; Acridone alkaloid biosynthesis; Caffeine metabolism; Betalain biosynthesis; Glucosinolate biosynthesis; Benzoxazinoid biosynthesis; Penicillin and cephalosporin biosynthesis; Carbapenem biosynthesis; Monobactam biosynthesis; Clavulanic acid biosynthesis; Streptomycin biosynthesis | 1 | Messenger RNA Biogenesis; Ribosome biogenesis in eukaryotes; Ribosome biogenesis; Mitochondrial biogenesis; Translation factors; Chaperones and folding catalysts; Protein export | 1 |
| Butirosin and neomycin biosynthesis; Puromycin biosynthesis; Novobiocin biosynthesis; Aflatoxin biosynthesis; Benzoate degradation   | 1 | Protein processing in endoplasmic reticulum   | 3 |
| Aminobenzoate degradation; Fluorobenzoate degradation; Chloroalkane and chloroalkene degradation; Chlorocyclohexane and chlorobenzene degradation; Toluene degradation; Xylene degradation; Nitrotoluene degradation; Ethylbenzene degradation; Styrene degradation; Atrazine degradation; Caprolactam degradation; 1 1 1 Trichloro 2 2 bis 4 chlorophenyl ethane DDT degradation; Bisphenol degradation; Dioxin degradation; Naphthalene degradation; Polycyclic aromatic hydrocarbon degradation; Furfural degradation; Steroid degradation; Metabolism of xenobiotics by cytochrome P450  | 6 | SNARE interactions in vesicular transport; SNAREs; Ubiquitin mediated proteolysis   | 4 |
| Drug metabolism cytochrome P450  | 4 | Ubiquitin system; Sulfur relay system; Proteasome   | 3 |
| Drug metabolism other enzymes; Enzymes; Protein kinases; Protein phosphatase and associated proteins; Peptidases; Cytochrome P450; KEGG modules in global; RNA polymerase; Basal transcription factors   | 1 | Proteasome; RNA degradation; DNA replication  | 6 |
| Transcription factors; Transcription machinery; Spliceosome  | 4 | DNA replication proteins; Chromosome and associated proteins; Base excision repair  | 2 |
| Spliceosome; Ribosome  | 1 | Nucleotide excision repair  | 1 |

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|---|---|--|----|
| Ribosome; Transfer RNA biogenesis; Aminoacyl tRNA biosynthesis; RNA transport   | 2 | Mismatch repair; Homologous recombination; Non homologous end joining; Fanconi anemia pathway  | 1  |
| mRNA surveillance pathway   | 1 | DNA repair and recombination proteins; Non coding RNAs; Transporters; ABC transporters; Phosphotransferase system PTS; Bacterial secretion system; Secretion system; Two component system; Two component system; Ras signaling pathway | 5  |
| Messenger RNA Biogenesis; Ribosome biogenesis in eukaryotes; Ribosome biogenesis; Mitochondrial biogenesis; Translation factors; Chaperones and folding catalysts; Protein export; Protein processing in endoplasmic reticulum  | 8 | Rap1 signaling pathway   | 7  |
| SNARE interactions in vesicular transport; SNAREs; Ubiquitin mediated proteolysis   | 2 | MAPK signaling pathway   | 9  |
| Ubiquitin system; Sulfur relay system; Proteasome   | 1 | MAPK signaling pathway yeast   | 1  |
| Proteasome; RNA degradation   | 4 | ErbB signaling pathway   | 7  |
| DNA replication; DNA replication proteins; Chromosome and associated proteins; Base excision repair; Nucleotide excision repair; Mismatch repair; Homologous recombination; Non homologous end joining; Fanconi anemia pathway; DNA repair and recombination proteins; Non coding RNAs; Transporters; ABC transporters; Phosphotransferase system PTS; Bacterial secretion system; Secretion system; Two component system | 3 | Wnt signaling pathway  | 10 |
| Two component system; Ras signaling pathway   | 4 | Notch signaling pathway  | 2  |
| Rap1 signaling pathway  | 6 | Hedgehog signaling pathway   | 2  |
| MAPK signaling pathway  | 7 | TGF beta signaling pathway   | 3  |
| ErbB signaling pathway  | 3 | Hippo signaling pathway  | 7  |
| Wnt signaling pathway   | 2 | VEGF signaling pathway   | 1  |
| Notch signaling pathway; Hedgehog signaling pathway; TGF beta signaling pathway   | 2 | Jak STAT signaling pathway   | 6  |
| Hippo signaling pathway   | 3 | NF kappa B signaling pathway   | 5  |
| VEGF signaling pathway  | 2 | TNF signaling pathway  | 7  |
| Jak STAT signaling pathway  | 3 | HIF 1 signaling pathway  | 3  |
| NF kappa B signaling pathway  | 2 | FoxO signaling pathway   | 4  |
| TNF signaling pathway   | 4 | Calcium signaling pathway  | 11 |
| HIF 1 signaling pathway   | 4 | Phosphatidylinositol signaling system  | 5  |
| FoxO signaling pathway  | 4 | Phospholipase D signaling pathway  | 11 |
| Calcium signaling pathway   | 8 | Sphingolipid signaling pathway   | 3  |
| Phosphatidylinositol signaling system   | 1 | cAMP signaling pathway   | 10 |
| Phospholipase D signaling pathway   | 2 | cGMP PKG signaling pathway   | 4  |
| Sphingolipid signaling pathway  | 3 | PI3K Akt signaling pathway   | 23 |
| cAMP signaling pathway  | 2 | AMPK signaling pathway   | 9  |
| cGMP PKG signaling pathway  | 5 | mTOR signaling pathway   | 5  |
| PI3K Akt signaling pathway  | 7 | Cytokine cytokine receptor interaction   | 10 |
| AMPK signaling pathway  | 3 | Cytokines; ECM receptor interaction  | 5  |
| mTOR signaling pathway  | 3 | Cell adhesion molecules CAMs   | 13 |

|   |    |   |    |
|---|----|---|----|
| Plant hormone signal transduction; G protein coupled receptors; Enzyme linked receptors; Cytokine receptors; Nuclear receptors; Ion channels; GTP binding proteins; Neuroactive ligand receptor interaction | 2  | Cell adhesion molecules and their ligands; CD Molecules; Lectins; Bacterial toxins; Endocytosis   | 14 |
| Cytokine cytokine receptor interaction  | 7  | Exosome; Phagosome  | 12 |
| Cytokines; ECM receptor interaction   | 1  | Lysosome  | 2  |
| Cell adhesion molecules CAMs  | 5  | Peroxisome  | 2  |
| Cell adhesion molecules and their ligands; CD Molecules; Lectins; Bacterial toxins; Endocytosis   | 9  | Regulation of autophagy; Regulation of mitophagy yeast; Prokaryotic Defense System; Bacterial chemotaxis; Bacterial motility proteins; Flagellar assembly; Regulation of actin cytoskeleton | 6  |
| Exosome; Phagosome  | 8  | Cytoskeleton proteins; Cell cycle   | 9  |
| Lysosome  | 1  | Cell cycle yeast  | 4  |
| Peroxisome  | 2  | Cell cycle Caulobacter; Meiosis yeast   | 4  |
| Regulation of autophagy; Regulation of mitophagy yeast; Prokaryotic Defense System; Bacterial chemotaxis; Bacterial motility proteins; Flagellar assembly; Regulation of actin cytoskeleton                 | 6  | Oocyte meiosis  | 3  |
| Cytoskeleton proteins; Cell cycle   | 3  | Apoptosis   | 12 |
| Cell cycle yeast; Cell cycle Caulobacter; Meiosis yeast; Oocyte meiosis; Apoptosis  | 8  | p53 signaling pathway   | 2  |
| p53 signaling pathway   | 3  |   |    |
| Focal adhesion  | 7  |   |    |
| Adherens junction   | 3  |   |    |
| Tight junction  | 9  |   |    |
| Gap junction  | 2  |   |    |
| Signaling pathways regulating pluripotency of stem cells; Hematopoietic cell lineage  | 4  |   |    |
| Complement and coagulation cascades   | 4  |   |    |
| Platelet activation   | 2  |   |    |
| Toll like receptor signaling pathway  | 3  |   |    |
| NOD like receptor signaling pathway   | 7  |   |    |
| RIG I like receptor signaling pathway   | 3  |   |    |
| Cytosolic DNA sensing pathway   | 1  |   |    |
| Natural killer cell mediated cytotoxicity   | 4  |   |    |
| Antigen processing and presentation   | 11 |   |    |

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